# Department of Agriculture, C. P.

# REPORT

ON THE

# NAGPUR EXPERIMENTAL FARM

IN THE

## CENTRAL PROVINCES,

FOR THE YEAR 1892-93,

Ending 31st March 1893.

NAGPUR:

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| SUBJECT. |
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| Report on the Nagpur Experimental Farm for the year 1892-93. |

FROM

J. B. FULLER, ESQ., I. C. S., C. I. E.,

COMMISSIONER OF SETTLS. AND AGRICULTURE,

*Central Provinces,*

To

THE SECRETARY TO THE CHIEF COMMISSIONER,

REVENUE DEPARTMENT,

*Central Provinces.*

*Dated Nagpur, the* 17*th November* 1893.

SIR,

I have the honour to submit the annual report on the Nagpur Experimental Farm for the year ending March 31st, 1893.

2. During the past three years a very important change has been made in the system on which experiments are conducted. A certain number of the Farm fields have all along been appropriated to permanent experiments, running year after year on definite and continuous lines. But the greater number of the experiments made each year have been specially devised for that year,—often without much reference to the teachings of previous years, to the fitness of the land selected for the experiment, or to the inadequacy of a single year's results to throw light on the question at issue. This has now been changed. By far the greater number of the experiments are now settled on a continuous basis, and will be conducted year after year on plots specially selected for the purpose. I have had this year's report drawn up in a form suited to the new programme, the results of the permanent experiments being shown in a definite order with serial numbers attached, so as to preserve continuity in tabulating the annual results and in drawing inferences from them.

It may be objected to the programme that a considerable proportion of its experiments merely test native practices and are not immediately connected with ideas for their improvement. But in my opinion the Farm will serve a very useful purpose if it indicates the *raison d'etre* and measures the results of processes known to the ryot, which, being out of accord with European practice, are often hastily condemned by his critics. Apart from the interest which attaches to such an enquiry, it is needed to give us the accurate knowledge of existing circumstances without which it is impossible to judge whether there is any practical possibility of improving them.

3. So far as the experiments were affected by the seasons, the most striking feature of the year was the extraordinarily destructive attack of rust which followed the wet weather of February. Very heavy rain had fallen at sowing time, and early in the season an outbreak of fungoid disease was apprehended in case of continued cold weather rain. The worst anticipations were realized. I noticed that in the course of a single night the wheat fields assumed an unhealthy brownish tinge, and the grain, which had at the time just set, rapidly shrivelled in the ears. Early sown crops were seemingly sufficiently advanced in growth to resist the disease and suffered comparatively little. But with late sown wheat the thicker the crop the greater was the injury, and, in some cases, the grain yielded by most promising fields was so light as to hardly stand

winnowing. Spraying the crops with either sulphate of copper or sulphate of iron proved absolutely useless. The result with some experiments has been to positively reverse the outturns, the plots which promised best and would actually have yielded heaviest, giving in grain the lightest return. The only indication of the true result of the experiment is in these cases to be gathered from the weight of the straw.

4. In the case of the large number of experiments which have only been initiated within the last two or three years, the results as yet obtained are generally insufficient to argue from, and I will only give brief notice of outturns which seemingly give pretty safe grounds for conclusion. The longest established experiments on the Farm are those serially numbered 18 and 19 in the report, which have now for nine years tested the effect of applying manure to wheat. In No. 18 no irrigation is used. The averages for the preceding eight years show that cattle-dung adds about Rs. 5 to the produce per acre and barely covers its cost. Saltpetre adds Rs. 12, but gives a loss in net profit. Bone-dust and green soiling are of very little effect. These results account for the very small use which is made of manure in tracts (such as the Nerbudda Valley) where wheat is grown year after year without rotation. In such places the people counteract the exhaustion of the soil by sowing gram with their wheat, but rarely apply manure to their wheat lands. The use of irrigation, however, produces very different results. In experiment No. 9 the plots have been irrigated during the last three years and the results are very instructive. The gain given by saltpetre is raised from Rs. 12 to Rs. 28, and under these circumstances it might well pay the ryot to use it as manure. The effect of cattle-dung is also doubled. *But no increase is gained on the unmanured plot.* The season under report was peculiarly unfavourable for irrigation, as the cold weather rains were so copious as to render it, to all appearances, quite unnecessary, and it was only used in order to preserve the conduct of the experiment unbroken. We find, accordingly, that it only added to the outturn in the case of the plots manured with saltpetre, and the close correspondence between the yields of straw shows that the general failure of irrigation to give an increase was not the result of greater loss from rust on the irrigated plots. Though irrigation generally gave no profit, it did not aggravate fungoid disease as one would have been inclined to anticipate. And cold weather rains of this character are of course very rarely experienced.

5. Turning now to experiments with a shorter term to their credit, the first which calls for notice is that to test the effect of deep-ploughing (Serial No. 1). The outturns of three years go to show that deep-ploughing is always injurious to a wheat crop immediately following, but that if not repeated it adds to the outturn in the succeeding two years. A point which may be taken as satisfactorily settled by three years' experiments is that the most profitable rate for sowing wheat is 90 lbs. per acre (Serial No. 23), and that the suggestions, often made, that the amount of seed can be reduced with advantage, are not borne out by practice. In experiment No. 5 the admixture of gram with wheat is shown to add to the productiveness of the wheat seed sown, and though, during the year under report, it resulted in a small loss, this is probably due to the fact that the gram was used in too large a proportion. In previous years it gave a small increase in profit. Experiment No. 7 confirms the practice common in the Chhattisgarh country, of using kodon (*Paspalum scrobiculatum*) as a rotation crop with wheat. It apparently adds considerably to the outturn, though owing to its low market value it can only be grown profitably when used for home consumption. Experiments with green soiling (Serial No. 9) by growing and ploughing in a crop of *san*-hemp (*Crotalaria juncea*) every other year, show a gain in annual produce of from Rs. 3 to Rs. 5 per acre, whether wheat be alternated with bare fallow or with cotton. If the green manure used be weeds cut elsewhere and carted on to the land (Serial No. 11), the gain is much more considerable, amounting annually to about Rs. 11 per acre. But this does not pay for the cost of cutting and carriage. Two experiments (Nos. 12 and 13), one with wheat and the other with cotton, demonstrate the superior value of cattle-dung collected in masonry stalls so as to conserve the urine.

6. Two interesting experiments with different varieties of cotton (fields Nos. 9 and 59) show that in spite of the relatively low price commanded by short-stapled cotton (locally known as *jari*) in the market, its cultivation was this year more profitable than that of higher class cottons. This result (which is borne out by the experience of 1890) is moreover shown on the assumption that a ryot who grows long-stapled cotton secures the full difference between its price and that of short-stapled cotton, which, owing to the action of the middle men, is very rarely the case. In 1891 the better class cottons were more profitable, and though we cannot as yet accept the question as definitely settled either way, there is enough to weaken the common assertion that the extending cultivation of short-stapled cotton is as injurious to the interests of the ryot as it is to the interests of the export trade to Europe, and that Government would do well to interfere to promote the growth of long-stapled varieties.

7. The report omits to notice some interesting observations which were made in regard to the damage caused to wheat crops by trees growing near them. This damage is often ascribed to the influence of shade, but facts opposed to this view are that crops suffer as much on the south as on the north side of trees, that the damage often extends far beyond the reach of the shade, and that the area of damage varies very greatly from year to year, being largest when there is least cold weather rain. Bamboo clumps and mango trees on the margins of some of the Farm fields have hitherto rendered a very large area unfit for wheat cultivation—in one case the area damaged extending to a distance of over 100 feet. This year the plan was tried of cutting off the surface roots by digging trenches to a depth of 3 feet at distances varying according to the size of the tree from 3 to 12 feet from the tree trunk. The trenches were dug at the end of August and kept open during the cold weather. Where protected by these trenches the wheat crop suffered no injury whatever. This may have been partly due to the abundance of the cold weather rainfall, and I should hesitate to draw certain conclusions till there are the results of another season's experiments to go upon. But it is a fact that unprotected crops did suffer in places in spite of the good rainfall. The trenches can, of course, be filled up before the rains if the land is required for kharif crops, which, as a rule, suffer but little from trees in their proximity.

8. At the end of the report will be found a brief notice of the state of the Agricultural Class attached to the Farm. Things are generally satisfactory, but the fact must not be disguised that students join simply as a means of obtaining Government employ, and that if their class certificates fail them in this direction, their numbers will rapidly decline. Enquiries which I have recently made from Settlement Officers seem to show that the course of instruction is really useful as a preparation for the post of Revenue Inspector. But the vacancies in this branch of service are not unlimited, and unless Deputy Commissioners and Forest Officers can utilize this special education by accepting passed students for appointments on the Court of Wards and Forest establishments, I fear that the class may not prove long-lived. The experience of its sister-class in Engineering has shown that people in the northern districts are much more ready than those of the Nagpur country to take advantage of technical education, and had it been possible to start the Agricultural Class at Jubbulpore, its chances of success would, I think, have been much more assured.

I have the honour to be,

Sir,

Your most obedient Servant,

J. B. FULLER,

*Commr. of Settls. and*

Secretariat Press, Nagpur :—20-11-93—360.

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| SUBJECT. |
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| Report on the Nagpur Experimental Farm for the year 1892-93. |

FROM

THE SUPERINTENDENT,

EXPERIMENTAL FARM,

*Nagpur,*

To

THE COMMR. OF SETTLEMENTS AND AGRICULTURE,

*Central Provinces.*

*Dated Nagpur, the 2nd September* 1893.

SIR,

I have the honour to submit the annual report on the working of the Experimental Farm, Nagpur, for the year ending the 31st March 1893. I should explain that during 10 months of the year the Farm was in charge of Mr. P. S. Parthasarathi Iyengar, and did not come under my superintendence until the 10th February 1893. My connection with the year's experiments was then limited to the harvesting of the rabi crops.

2. The character of the season was on the whole very unfavourable. The total rain-fall of the year amounted to 51 inches, exceeding by 1·27 inches the average of the preceding 18 years. I contrast its distribution with the normal distribution of the rain-fall:—

| Month. | | Number of rainy days. | Rain-fall. | Average of 18 years preceding. | Month. | | Number of rainy days. | Rain-fall. | Average of 18 years preceding. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Inches. | Inches. | | | | Inches. | Inches. |
| April | 1st half | ... | ... | ·12 | October | 1st half | ... | ... | 1·55 |
| | 2nd half | ... | ·02 | ·25 | | 2nd half | 8 | 3 74 | 1·35 |
| May | 1st half | ... | ·01 | ·29 | November | 1st half | ... | ... | ·63 |
| | 2nd half | ... | ... | ·27 | | 2nd half | ... | ... | ·24 |
| June | 1st half | 3 | 1 83 | 3·11 | December | 1st half | ... | ... | ·16 |
| | 2nd half | 4 | 4·34 | 4·95 | | 2nd half | ... | ·08 | ·39 |
| July | 1st half | 10 | 5·74 | 7·80 | January | 1st half | 2 | 2·10 | ·36 |
| | 2nd half | 11 | 7·72 | 7·01 | | 2nd half | 3 | 1·47 | ·20 |
| August | 1st half | 6 | 2·36 | 6·66 | February | 1st half | ... | ... | ·13 |
| | 2nd half | 6 | 6·21 | 4·26 | | 2nd half | 2 | ·63 | ·26 |
| September | 1st half | 7 | 9·19 | 4·52 | March | 1st half | 7 | 3·26 | ·12 |
| | 2nd half | 4 | 2·35 | 4·87 | | 2nd half | ... | ... | ·23 |
| | | | | | Total | | 73 | 51·00 | 49·73 |

No rain fell during the hot weather to assist the preparation of the land by ploughing and bakharing. The monsoon set in fairly punctually and the kharif crops were sown in good time. The rain-fall of July was rather too continuous for juari, but at the end of August both juari and cotton promised well, and there were hopes of a good harvest. Excessive rain fell in September and the cotton suffered damage which was much increased by an unusually heavy fall which occurred at the end of October. The cotton crop was very disappointing and the juari not above average.

The *rabi* sowings had been taken in hand before the October rain came down. The linseed had made some growth and was damaged but little. But much of the wheat was just sprouting and suffered so much from swamping that a number of fields had to be resown. Apart from this resowing, a considerable proportion of the wheat was not sown till after the October rain, which fell while sowing operations were in full swing.

The wheat started with sufficient moisture and timely rain in January brought the crop into really magnificent appearance. General hopes were entertained of a bumper crop such as had not been gathered for years past, but these hopes were to be disappointed. Rain again set in during the end of February and the beginning of March, and the unusual moisture brought on an extraordinarily virulent attack of rust, which speedily converted a most promising crop into what at first seemed to be utter failure. The early sown wheat suffered from rust comparatively little, but the heavy rain of March drenched it on the threshing floor, and much of the grain sprouted in the ear. Tur which was also then standing harvested suffered in the same way. The late sown wheat was comparatively immature at the end of February and was in the stage when rust is most destructive. The thicker the crop the more virulent was the disease, and the grain yielded by some of our finest fields was so thin and shrivelled as hardly to stand winnowing.

3. I will first of all give the results of those experiments which form part of a continuous series :—

**Serial No. 1.—Field No. 21.—Subject.—*The effect of deep tillage on wheat.***

Plot 1.—Area 0·08 acre. Ploughed every year.
" 2. " 0·08 " Bakhared (scarified) every year.
" 3. " 0·08 " Scarified every year and ploughed every third year.
Commenced in 1890-91. Crop, wheat. Unirrigated and unmanured.
During 1892-93 plot 3 was merely scarified, it having been ploughed in 1890-91

| No. of Plot. | Actuals, 1892-93. | | | | | Average for two previous years. | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Outturn per acre. | | | Cost of cultivation per acre. | Gain in value of produce on Plot 2. | Outturn per acre. | | | Gain in value of produce on Plot 2. |
| | Grain. | Straw. | Value. | | | Grain. | Straw. | Value. | |
| | lbs. | lbs. | Rs. a. p. | Rs. a. p. | Rs. a. p. | lbs. | lbs. | Rs. a p | Rs. a. p. |
| 1 | 131 | 828 | 16 0 10 | 12 12 1 | (—9 11 8) | 348 | 754 | 13 8 3 | (—4 1 0) |
| 2 | 694 | 1,356 | 25 12 6 | 11 6 3 | ..... | 468 | 957 | 17 9 3 | ..... |
| 3 | 765 | 1,784 | 29 8 3 | 11 5 2 | +3 11 9 | 512 | 840 | 19 0 9 | +1 7 6 |

The wheat was early sown and suffered comparatively little from rust. Plot No. 3 shows the best results, as also in the year preceding, whereas in the year when it received its ploughing *its outturn was the smallest of the three.* The outturns of plots 1 and 3 seem to show pretty clearly that the wheat crop is damaged by deep ploughing during the preceding rains, it is improved by the effect of the ploughing in subsequent years. But the experiment has not been made long enough to justify very positive conclusions.

**Serial Nos. 2 & 3.—Fields Nos. 41 & 43.—Subject.—*The effect of embankment in enhancing the value of manure to a wheat crop.***

No. 41.—Area 0·62 acre. Embanked in 1885. Annually manured with 160 maunds dung per acre.
" 43. " 0·70 " " " Never manured.
Commenced in 1890-91. Crop, wheat. Unirrigated.

| No. of field. | Actuals, 1892-93. | | | | | Average for two years preceding. | | |
|---|---|---|---|---|---|---|---|---|
| | Outturn per acre. | | | Cost of cultivation per acre. | Cost of manuring per acre. | Outturn per acre. | | |
| | Grain. | Straw. | Value. | | | Grain. | Straw. | Value. |
| | lbs. | lbs. | Rs. a. p | Rs. a p. | Rs. a. p. | lbs. | lbs. | Rs. a. p. |
| 41 | 560 | 1,598 | 22 2 11 | 9 10 9 | 11 8 3 | 835 | 990 | 29 13 6 |
| 43 | 251 | 733 | 10 0 1 | 9 5 0 | ..... | 577 | 723 | 20 12 9 |

The wheat in these plots was re-sown after the October rain. Both crops suffered much from rust, but it will be observed that in field No. 41 manure repaid its cost, a result very rarely attained on unembanked land. The conclusion to be drawn from the previous two years' experiments is similar though not quite so favourable.

Owing to the diversity in the extent to which fields suffered from rust, it is impossible to compare the outturns with those of other unembanked fields on the Farm in order to measure the effect of enbankment apart from manure.

**Serial No. 4.**—FIELD No. 22.—SUBJECT.—*The effect of growing cotton in a mixture instead of alone.*

The results of this experiment in which cotton is sown mixed with *tur** and with *juar* as well as alone were completely vitiated by inequality between the plots, some having suffered from water-logging to a much greater extent than others. The field is unsuitable for kharif cropping, and the experiment has been transferred to field No 23.

**Serial No. 5.**—FIELD No. 25.—SUBJECT.—*The effect of growing wheat mixed with gram.*

Plot 1.—Area 0·21 acre.—Wheat sown alone.
„ 2. „ 0·21 „ Wheat mixed with gram in equal proportions.
Commenced in 1890-91. Crop, wheat. Unmanured and unirrigated.

| No. of plot. | Actuals, 1892-93. | | | | | | Average for two years preceding. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Outturn per acre. | | | | Cost of cultivation per acre. | Gain in value per acre on plot 1. | Outturn per acre. | | | | Gain in value per acre on plot 1. |
| | Kind. | Grain. | Straw. | Value. | | | Kind. | Grain | Straw. | Value. | |
| | | lbs. | lbs. | Rs. a. p. | Rs. a. p. | Rs. a. p. | | lbs. | lbs | Rs. a. p. | Rs. a. p. |
| 1 | Wheat ... | 558 | 761 | 19 1 0 | 5 14 1 | ... | Wheat ... | 490 | 695 | 18 2 1 | ... |
| 2 | Wheat and Gram ... | 333<br>143 | 395<br>310 | 17 4 4 | 7 1 6 | 1 12 8 | Wheat and Gram ... | 321<br>231 | 444<br>370 | 19 11 4 | +1 9 3 |

The fields were sown early and suffered comparatively little from rust. Wheat seed when sown with a leguminous crop (gram) has been more productive than when sown alone. The quantity of wheat in plot No. 2 is 333 lbs., whereas in proportion to seed sown it should have been 279 lbs.—a gain of nearly a fifth. Gram seed was sown in equal proportions with wheat during the year under report. In future the proportion will be reduced to a third in accordance with the general practice of cultivators in the Nerbudda Valley districts.

**Serial No. 6.**—FIELD No. 33.—SUBJECT.—*Rotations with cotton.*

Field No. 33 like No. 22 has proved quite unsuitable for kharif experiments as a portion of it is much water-logged during the rains. The results are misleading and not worth record. The experiment has now been re-commenced on another field (No 61.)

**Serial No. 7.**—FIELD No. 29.—SUBJECT.—*Rotations with wheat.*

Plot 1.—Area 0·29 acre.—Wheat every year.
„ 2. „ 0·29 „ Wheat and fallow alternately.
„ 3. „ 0·29 „ Wheat and gram do.
„ 4. „ 0·29 „ Wheat, juar and tur do.
„ 5. „ 0·29 „ Wheat and kodon do.
Commenced in 1890-91. Unmanured and unirrigated. Crop in 1892-93, wheat throughout all the plots.

| No. of Plot. | Actuals, 1892-93. | | | | | Total outlay in cultivation per acre since commencement of experiment (3 years). | Total value of produce per acre since commencement of experiment (3 years). | Total profit per acre since commencement of experiment (3 years). |
|---|---|---|---|---|---|---|---|---|
| | Crop. | Outturn per acre. | | | Cost of cultivation per acre. | | | |
| | | Grain. | Straw. | Value. | | | | |
| | | lbs. | lbs. | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p. |
| 1 | Wheat ... | 689 | 1,680 | 28 15 7 | 8 5 7 | 24 2 8 | 71 5 6 | 47 2 10 |
| 2 | „ ... | 598 | 1,643 | 25 13 2 | 8 4 6 | 16 3 3 | 47 0 10 | 30 13 7 |
| 3 | „ . | 533 | 1,574 | 23 6 8 | 8 1 4 | 23 1 7 | 55 9 0 | 32 7 5 |
| 4 | „ ... | 666 | 1,766 | 28 8 4 | 8 3 11 | †23 7 3 | 80 9 0 | 57 1 9 |
| 5 | „ ... | 760 | 1,667 | 31 4 6 | 8 4 9 | †22 8 3 | 42 8 11 | 20 0 8 |

*Cajanus flavus—the Pigeon pea.
†Exclusive of cost of watching.

It is noticeable that the previous year's fallowing of plot 2 added in no way to its outturn, and that the best result is given by the rotation with kodon, which is the customary rotation of Chhattisgarh. Owing, however, to the low value of the kodon in the market the financial results of this rotation are the worst of any. But a longer period is required for safe deductions.

**Serial No. 8.—Field No. 57.—Subject.—*Rotations with linseed.***

Plot 1.—Area 0·28 acre. Linseed every year.
" 2. " 0·28 " Linseed and gram alternately.
" 3. " 0·28 " Linseed and cotton do.
" 4. " 0·28 " Linseed and tur do.
Commenced in 1890-91. Unmanured and unirrigated.
Crop in 1892-93. Linseed throughout all the plots.

| No. of Plot. | Actuals, 1892-93. | | | | | Total outlay in cultivation since commencement of experiment (3 years). | Total value of produce per acre since commencement of experiment (3 years). |
|---|---|---|---|---|---|---|---|
| | Crop. | Outturn per acre. | | | Cost of cultivation per acre. | | |
| | | Grain. | Straw. | Value. | | | |
| | | lbs. | lbs. | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p. |
| 1 | Linseed ... | 22 | 4 | 0 0 5 | 5 13 5 | 18 6 0 | 8 3 3 |
| 2 | " ... | 22 | 2 | 0 0 4 | 5 13 5 | 20 9 2 | 8 0 7 |
| 3 | " ... | 22 | 2 | 0 0 4 | 5 13 5 | 21 2 1 | 16 9 9 |
| 4 | " . | 22 | 3 | 0 0 5 | 5 13 5 | 21 1 2 | 21 9 6 |

The linseed crop was a complete failure. In 1890-91 it was also very poor, and this field seems to be peculiarly liable to the linseed disease known as *talap*. The experiment will show whether this disease can be eradicated by rotations.

**Serial No. 9.—Field No. 14.—Subject.—*Green-soiling with san hemp for wheat and cotton.***

Plot 1.—Area 0·19 acre. Green-soiling followed by fallow and then by wheat.
" 2. " 0·19 " As above without the green soiling.
" 3. " 0·19 " Green-soiling followed by wheat and then by cotton.
" 4. " 0·22 " As above without the green-soiling.
Commenced in 1891-92. No green-soiling during the year under report.

| No. of Plot. | Actuals, 1892-93. | | | | | Total from commencement of experiment (two years). | |
|---|---|---|---|---|---|---|---|
| | Crop. | Outturn per acre. | | | Cost of cultivation.* | Cost of cultivation including green-soiling. | Value of produce per acre. |
| | | Grain or lint. | Straw or seed. | Value. | | | |
| | | lbs. | lbs. | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p. |
| 1 | Wheat ... | 911 | 1,705 | 36 6 8 | 11 2 6 | 26 2 0 | 36 6 8 |
| 2 | " ... | 829 | 1,076 | 31 6 4 | 10 1 10 | 18 0 2 | 31 6 4 |
| 3 | Cotton .. | 89 | 225 | 29 7 10 | 11 11 3 | 30 12 1 | 47 4 1 |
| 4 | " ... | 79 | 207 | 26 4 9 | 11 2 9 | 22 15 8 | 41 15 6 |

The above experiment is a double one. One pair of plots is fallow in the year of green soiling and grows wheat during the following year. The other pair grows wheat after the green-soiling followed by cotton in the next kharif season. In the first pair of plots the previous year's green-soiling added Rs. 5 to the value of the wheat crop. But it cost considerably more than this. In the second pair of plots it added only Rs. 3 worth to the outturn of cotton, which is much less than was anticipated. Taking the two years together, green-soiling has resulted in a loss of Rs. 2-8-0 per acre though adding somewhat to the produce.

* As no plots were green-soiled during the year, there is no charge on this account.

**Serial No. 10.**—FIELD No. 17.—SUBJECT.—*Effect of green-soiling with cut weeds, known as tarota, in alternate years on cotton and wheat in rotation.*

Plot 1.—Area 0·15 acre. Green-soiled with cut weeds every alternate year.
" 2. " 0·08 " No manure.
Both plots cropped with cotton and wheat alternately; wheat in the year of green-soiling.
Commenced in 1890-91. Unirrigated. Crop during 1892-93 wheat green-soiled on plot 1.

| No. of plot. | Actuals, 1892-93. | | | | | | | | | Total from commencement of experiment (three years). | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Crop. | Outturn per acre. | | | | | Cost of cultivation per acre. | | | Cost of green-soiling per acre. | | | Cost of cultivation including green-soiling. | | | Value of produce per acre. | | |
| | | Grain. | Straw. | Value. | | | | | | | | | | | | | | |
| | | lbs. | lbs. | Rs. | a. | p. | Rs. | a. | p | Rs. | a. | p. | Rs. | a. | p. | Rs. | a. | p. |
| 1 | Wheat. | 492 | 1,635 | 20 | 5 | 4 | 10 | 4 | 5 | 17 | 13 | 0 | 64 | 12 | 4 | 60 | 12 | 2 |
| 2 | Do. | 275 | 1,200 | 12 | 6 | 8 | 13 | 5 | 6 | ..... | | | 44 | 11 | 8 | 39 | 7 | 3 |

The weed used during the current year was that known as *tarota*, of the Cœsalpinia class. It was cut on waste land near the farm, carried to the field and ploughed in. Owing to the cost of carriage this method of green-soiling is much more expensive than by growing *san* hemp on the land, and ploughing it in. The excess in outlay is about Rs. 8 per acre.

Both plots suffered from rust, and the outturns are very poor. The manuring greatly increased the outturn, but owing to the poverty of the crop it only added Rs. 8 to the value of the produce, while it cost Rs. 17.

In previous years, the crop on these plots has also been indifferent. Taking the experiment from its commencement, the expenditure of Rs. 20 has added Rs. 21 to the produce, and the results are so far not unsatisfactory. The *tarota* is only applied in alternate years, and its cost per acre per annum is only half the cost of a single application.

**Serial No. 11.**—FIELD No. 32.—SUBJECT.—*Effect of green-soiling with cut weeds, known as tarota, on wheat year after year.*

Plot 1.—Area 0·16 acre. Annually green-soiled and sown with wheat.
" 2. " 0·16 " Unmanured and sown with wheat.
Commenced in 1891-92. Unirrigated. Crop during 1892-93 wheat.

| No. of plot. | Actuals, 1892-93. | | | | | | | | | | | | | | | Total from commencement of experiment (two years). | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Outturn per acre. | | | | | | Cost of cultivation per acre. | | | Cost of green-soiling per acre. | | | Gain in value of produce per acre. | | | Cost of cultivation including green-soiling. | | | Value of produce per acre. | | |
| | Grain. | Straw. | Value. | | | | | | | | | | | | | | | | | | |
| | lbs. | lbs. | Rs. | a. | p. | Rs | a. | p. | Rs. | a. | p. | Rs. | a. | p. | Rs. | a. | p. | Rs. | a. | p. |
| 1 | 1,136 | 1,833 | 39 | 13 | 6 | 9 | 13 | 9 | 17 | 4 | 7 | 15 | 10 | 3 | 50 | 10 | 10 | 62 | 10 | 7 |
| 2 | 714 | 923 | 24 | 3 | 3 | 9 | 3 | 11 | ..... | | | ..... | | | 18 | 8 | 10 | 43 | 7 | 11 |

Here again *tarota* is used, but is applied every year instead of every alternate year, and wheat is grown continuously instead of in rotation with cotton as in the last experiment.

The outturn of both plots was above the average, and the green-soiling added over Rs. 15 to the value of the outturn. But it failed to cover its cost, which owing to cartage was very heavy.

The previous year's crop was a very poor one, and the manuring gave but little result. Hence taking two years together an increase of Rs. 32 in outlay has added only Rs. 19 to the produce.

In this and the preceding experiment a Papilionacious weed will, in future, be substituted for the *tarota*.

Serial No. 12.—Field No. 18.—Subject.—*Relative effect of green-soiling, box-dung and stall-dung on wheat grown continuously.*

Plot 1.—Area 0·26 acre. Green-soiled with *san* hemp (Crotalaria juncea) every year.
" 2. " 0·26 " Unmanured.
" 3. " 0·26 " Manured with box-dung at 240 maunds per acre.
" 4. " 0·26 " Manured with ordinary dung at 160 maunds per acre.
Commenced in 1890-91. Unirrigated. Crop during 1892-93 wheat.

| No. of plot. | Actuals, 1892-93. | | | | | | Average for two previous years. | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Outturn per acre. | | | Cost of cultivation per acre. | Cost of manuring per acre. | Gain in value on plot 2. | Outturn per acre. | | | Gain in value on plot 2. |
| | Grain. | Straw. | Value. | | | | Grain. | Straw. | Value. | |
| | lbs. | lbs. | Rs. a. p. | Rs. a. | Rs. a. p. | Rs. a. p. | lbs. | lbs. | Rs. a. p. | Rs. a. p. |
| 1 | 764 | 1,101 | 26 5 0 | 7 9 9 | 9 2 2 | 3 15 9 | 551 | 835 | 21 10 2 | 2 0 10 |
| 2 | 655 | 880 | 22 5 3 | 9 9 6 | ... | ... | 499 | 732 | 19 9 4 | ... |
| 3 | 919 | 1,796 | 33 6 0 | 10 7 4 | 12 7 0 | 11 0 9 | 548 | 850 | 21 10 2 | 2 0 10 |
| 4 | 774 | 1,187 | 26 14 8 | 10 1 3 | 11 5 9 | 4 9 5 | 636 | 828 | 24 7 5 | 4 14 1 |

This experiment tests the effect of various manures applied every year to unirrigated wheat. The wheat crop was re-sown after the heavy rain of October and its outturn is fair. The cost of green-soiling is not so great as in the two preceding experiments since it is effected by growing a crop of *san* hemp on the land and ploughing it in as it stands. It added Rs. 4 to the produce, but this is less than half its cost. By "box-dung" is meant cattle-dung collected in special stalls where the cattle stand on bedding which absorbs the urine. To allow for the bedding it is applied in 50 per cent. larger quantity than the ordinary stall-dung. It shows good results, adding Rs. 11 to the outturn. Its cost is given as Rs. 12-7-0, but it would not be nearly so expensive to the ryot.

Ordinary cattle-dung added comparatively little to the outturn. The averages for the two previous years are very unfavourable to all three kinds of manure.

**Serial No. 13.**—FIELD No. 44.—SUBJECT.—*Relative effect of stall-dung, box-dung and bone-dust on cotton and wheat grown alternately.*

Plot 1.—Area 0·38 acre. Manured with stall-dung at 160 maunds per acre.
" 2. " 0·38 " Manured with box-dung at 240 maunds per acre.
" 3. " 0·38 " Unmanured.
" 4. " 0·38 " Manured with bone-dust at 360 lbs. per acre.
Commenced in 1890-91. Unirrigated. Crop during 1892-93 cotton.

| No. of plot. | Actuals, 1892-93. | | | | | | | | Average for two previous years. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Crop. | Outturn per acre. | | | Cost of cultivation per acre. | Cost of manure per acre. | Gain in value of produce on plot 3. | | Cost of cultivation including manure per acre. | Value of produce per acre. |
| | | Lint. | Seed. | Value. | | | | | | |
| | | lbs. | lbs. | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p. | | Rs. a. p. | Rs. a. p. |
| 1 | Cotton (Bani) ... | 48 | 147 | 16 5 2 | 8 3 7 | 11 13 3 | 7 14 11 | | 19 2 8 | 9 15 9 |
| 2 | Do. ... | 61 | 174 | 20 8 7 | 9 9 6 | 12 6 11 | 12 2 4 | | 20 6 10 | 10 11 3 |
| 3 | Do. ... | 25 | 70 | 8 6 3 | 7 12 4 | ... | ... | | 7 15 6 | 8 4 7 |
| 4 | Do. ... | 24 | 68 | 8 1 2 | 7 1 2 | 4 4 8 | —0 5 1 | | 7 14 10 | 11 10 5 |

This experiment is similar to the preceding except in that bone-dust is substituted for green-soiling and that cotton is alternated with wheat. The cotton crop of the year was very poor as the field suffered from swamping, but the effect of dung on the outturn is marked. Ordinary stall-dung doubled the produce and box-dung gave still better results. Bone-dust produced no effect.

The averages for the two preceding years are but little to the credit of the manures principally because of their very small results with the preceding year's wheat crop.

**Serial No. 14.**—FIELD No. 63.—SUBJECT.—*Relative effect on linseed and cotton in rotation of box-dung and stall-dung applied in alternate years only.*

Plot 1.—Area 0·32 acre. Manured with box-dung at 240 maunds per acre.
" 2. " 0·32 " Unmanured.
" 3. " 0·32 " Manured with stall-dung at 160 maunds per acre.
Commenced in 1890-91. Unirrigated. Crop during 1892-93 linseed.

| No. of plot. | Actuals, 1892-93. | | | | | | | | Average for two previous years. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Crop. | Outturn per acre. | | | Cost of cultivation per acre. | Cost of manure per acre. | Gain in value of produce on plot 2. | | Cost of cultivation including manure per acre. | Value of produce per acre. |
| | | Grain. | Straw. | Value. | | | | | | |
| | | lbs. | lbs. | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p. | | Rs. a. p. | Rs. a. p. |
| 1 | Linseed ... | 12 | 43 | 0 13 8 | 7 2 7 | 14 3 1 | 0 11 3 | | 17 0 8 | 11 13 0 |
| 2 | Do. ... | 2 | 10 | 0 2 5 | 6 13 1 | ..... | ..... | | 10 1 5 | 14 0 3 |
| 3 | Do. ... | 5 | 22 | 0 5 10 | 6 13 8 | 11 9 11 | 0 3 5 | | 16 6 7 | 15 15 3 |

This experiment tests the effect of manures on the linseed crop grown in rotation with cotton. The outturn of linseed in all these plots is very poor. The field seems peculiarly liable to the linseed disease known as *talap* and is moreover infested with the sedgy weed known as *nagar motha* (*Cyperus pertennis*).

The manure is applied in the years of linseed sowing, and one point on which the experiment is intended to throw light is the residuary effect of the manure on the cotton. In the year preceding it affected the cotton outturns but little, but this was perhaps due to the character of the season.

**Serial No. 15.—Field No. 42.—Subject.—*Relative effect of dung and bone-dust applied each year on juar and linseed grown in rotation.***

Plot 1.—Area 0·38 acre. Manured with dung at 160 maunds per acre.
" 2. " 0·38 " Unmanured.
" 3. " 0·38 " Manured with bone-dust at 360 lbs. per acre.
Commenced in 1890-91. Unirrigated. Crop during 1892-93 juar.

| No. of plot. | Actuals, 1892-93. | | | | | | | Average for two previous years. | |
|---|---|---|---|---|---|---|---|---|---|
| | Crop. | Outturn per acre. | | | Cost of cultivation per acre. | Cost of manure per acre. | Gain in value of produce on plot 2. | Cost of cultivation including manure per acre. | Value of produce per acre. |
| | | Grain. | Fodder. | Value. | | | | | |
| | | lbs. | lbs. | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p. |
| 1 | Juar. | 368 | 2,508 | 23 14 11 | 6 11 11* | 11 5 7 | 6 5 5 | 14 14 0 | 11 0 1 |
| 2 | Do. | 322 | 1,616 | 17 9 6 | 7 12 7 | ... | ..... | 5 14 7 | 9 6 6 |
| 3 | Do. | 355 | 1,692 | 18 14 2 | 6 0 6 | 3 7 4 | 1 4 8 | 8 14 2 | 9 7 1 |

The outturn of juar was poor. Dung added considerably, but not in proportion to its cost. Bone-dust here again shows badly. The linseed crop grown in the year preceding was a total failure, and this has lowered the average produce.

**Serial No. 16.—Field No. 65—Subject.—*Effect of liming soils, on wheat in rotation with cotton.***

Plot 1.—Area 0·46 acre. Manured with lime in 1890-91 (not to be limed again until 1902-03).
" 2. " 0·49 " Unmanured.
Commenced in 1890-91. Unirrigated. Crop during 1892-93 wheat.

| No. of plot. | Actuals, 1892-93. | | | | | | | Average for two previous years. | |
|---|---|---|---|---|---|---|---|---|---|
| | Crop. | Outturn per acre. | | | Cost of cultivation per acre. | Cost of manure per acre. | Gain in value of produce on plot 2. | Cost of cultivation including manure per acre. | Value of produce per acre. |
| | | Grain. | Straw. | Value. | | | | | |
| | | lbs. | lbs. | Rs. a. p. | Rs. a. p. | Rs. a p. | Rs. a. p. | Rs. a. p. | Rs. a. p. |
| 1 | Wheat ... | 517 | 1,124 | 21 3 10 | 9 11 7 | 7 1 10 | —0 12 9 | 18 4 3 | 18 4 8 |
| 2 | Do. .. | 533 | 1,195 | 22 0 7 | 9 0 7 | ... | ... | 10 11 6 | 18 11 1 |

Wheat was early sown in these plots, and they were not much attacked by rust. The outturns of both plots are fair for the season. Rs. 7-1-10 is one-twelfth of the original outlay in liming, the effect of which will last 12 years. The lime did not add to the produce, nor does it show any increase on the average of the two preceding years.

*Excluding cost of watching.

**Serial No. 17.**—FIELD No. 68.—SUBJECT.—*Effect on irrigated wheat of saltpetre drilled in with the seed and used as a top-dressing.*

Plot 1.—Area 0·10 acre. Wheat, unmanured.
" 2. " 0·10 " Wheat annually manured with saltpetre at 240 lbs. per acre drilled in with seed.
" 3. " 0·10 " Wheat annually manured with saltpetre applied as a top-dressing at 80 lbs. per acre.
Commenced in 1890-91. Crop in 1892-93 wheat. Once irrigated on the 13th December.

| No. of plot. | Actuals, 1892-93. | | | | | | | | Average for two previous years. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Outturn per acre. | | | Cost of cultivation per acre. | Cost of manure per acre. | Cost of Irrigation. | | Gain in value of produce on plot 1. | Outturn per acre. | | | Gain in value of produce on plot 1. |
| | Grain. | Straw. | Value. | | | Labour. | Assumed water-rate per acre watering. | | Grain. | Straw. | Value. | |
| | lbs. | lbs. | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p | Rs. a. p. | Rs. a. p. | lbs. | lbs. | Rs. a. p. | Rs. a. p. |
| 1 | 405 | 1,685 | 17 15 10 | 12 3 10 | ... | 0 11 8 | 2 0 0 | ... | 690 | 1,040 | 25 4 2 | ... |
| 2 | 640 | 1,940 | 25 12 4 | 12 2 2 | 19 3 6 | 0 9 2 | 2 0 0 | +7 12 6 | 1,316 | 2,470 | 49 2 9 | 23 14 7 |
| 3 | 235 | 1,185 | 11 3 3 | 11 0 8 | 4 14 4 | 0 6 8 | 2 0 0 | −6 12 7 | 701 | 1,040 | 25 7 6 | 0 3 4 |

The wheat was sown late and consequently suffered much from rust. The saltpetre used as top-dressing was applied the day before the irrigation. The amount of water used in irrigating ranged from 7,650 to 11,060 cubic feet per acre.

It is curious that the top-dressed plot yielded less than the unmanured plot, but this was due to rust. In the preceding years, there was no such deficit but neither was there any gain in produce. Drilled saltpetre gave a substantial increase, but the outturns were too poor to show its real effect.

**Serial No. 18.**—SERIES A.—SUBJECT.—*Effect on wheat grown continuously of different kinds of manures applied year after year without irrigation.*

Plot 1.—Area 0·10 acre. Manured with Saltpetre, 240 lbs. per acre.
" 2. " 0·10 " " Bone-dust, 360 lbs. per acre.
" 3. " 0·10 " " Saltpetre, 240 lbs. and bone-dust 360 lbs. per acre.
" 4. " 0·10 " " Dung 160 mds. per acre.
" 5. " 0·10 " " Dung 160 mds. and bone-dust 360 lbs. per acre.
" 6. " 0·10 " " Ashes of 160 mds. dung per acre.
" 7. " 0·10 " " Unmanured.
" 8. " 0·10 " " Green-soiled with *san* hemp.
Commenced in 1884-85. U irrigated. Crop during 1892-93, wheat.

| No. of plot. | Actuals, 1892-93. | | | | | | Average for eight previous years. | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Outturn per acre. | | | Cost of cultivation per acre. | Cost of manure per acre. | Gain in value of produce on plot 7. | Outturn per acre. | | | Gain in value of produce on plot 7. |
| | Grain. | Straw. | Value. | | | | Grain. | Straw. | Value. | |
| | lbs | lbs. | Rs. a p | Rs. a. p. | Rs. a. p. | Rs. a. p. | lbs. | lbs. | Rs. a. p | Rs. a. p. |
| 1 | 420 | 1,400 | 17 6 0 | 11 4 10 | 14 8 6 | 7 3 0 | 1,133 | 1,665 | 37 6 10 | 12 13 11 |
| 2 | 267 | 1,012 | 11 7 10 | 11 3 2 | 3 15 4 | 1 4 10 | 848 | 1,221 | 28 0 7 | 3 7 8 |
| 3 | 587 | 1,502 | 22 9 11 | 11 9 10 | 17 14 8 | 12 6 11 | 1,106 | 1,731 | 37 2 10 | 12 9 11 |
| 4 | 312 | 1,607 | 14 15 9 | 11 4 10 | 11 3 2 | 4 12 9 | 888 | 1,489 | 30 0 5 | 5 7 6 |
| 5 | 477 | 1,582 | 19 11 3 | 11 1 6 | 15 2 6 | 9 8 3 | 900 | 1,327 | 29 4 4 | 4 11 5 |
| 6 | 377 | 1,212 | 15 6 11 | 10 15 0 | 11 5 8 | 5 3 11 | 924 | 1,471 | 30 10 8 | 6 1 9 |
| 7 | 230 | 950 | 10 3 0 | 10 12 6 | ... | ... | 752 | 1,144 | 24 8 11 | ... |
| 8 | 312 | 1,137 | 13 4 2 | 9 2 8 | 9 3 6 | 3 1 2 | 726 | 1,126 | 24 5 10 | −0 3 1 |

This experiment has been proceeding for nine years. The wheat was late sown and was extraordinarily damaged by rust. The outturns are very poor, though the crop at one time promised magnificently as can be seen from the outturns of straw. The total produce being small, the increases gained by the manures are small also, and throw little or no light on the question which the experiment is intended to solve. The averages for the 8 years preceding are alone of interest.

**Serial No. 19.—Series B.—Subject.—*Effect on wheat grown continuously of different kinds of manures applied year after year with irrigation.***

Plot 1. Area 0·10 acre. Manured with Saltpetre, 240 lbs. per acre.
" 2. " 0·10 " " Bone-dust, 360 lbs. per acre.
" 3. " 0·10 " " Saltpetre, 240 lbs. and bone-dust 360 lbs. per acre.
" 4. " 0·10 " " Dung, 160 mds. per acre.
" 5. " 0·10 " " Dung, 160 mds. and bone-dust 360 lbs. per acre.
" 6. " 0·10 " " Ashes of 160 mds. dung per acre.
" 7. " 0·10 " " Unmanured.
" 8. " 0·10 " " Green-soiling with *san* hemp.

Commenced in 1890-91. Crop in 1892-93 wheat—irrigated once from the 14th to the 17th December.

| No. of plot. | Actuals, 1892-93. | | | | | | | | Average for two previous years. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Outturn per acre. | | | Cost of cultivation per acre. | Cost of manure per acre. | Cost of irrigation. | | Gain in value of produce on plot 7. | Outturn per acre. | | | Gain in value of produce on plot 7. |
| | Grain. | Straw. | Value. | | | Labour. | Assumed water-rate per acre watering. | | Grain. | Straw. | Value. | |
| | lbs. | lbs. | Rs. a. p. | Rs. a. p | Rs. a. p | Rs. a. p | Rs. a. p. | Rs. a. p. | lbs. | lbs. | Rs. a. p. | Rs. a. p. |
| 1 | 482 | 2,127 | 21 13 6 | 11 9 10 | 14 8 6 | 0 9 2 | 2 0 0 | 12 7 11 | 1,453 | 2,153 | 55 5 1 | 28 9 8 |
| 2 | 432 | 1,037 | 16 6 4 | 11 12 4 | 3 15 4 | 0 10 0 | 2 0 0 | 7 0 9 | 892 | 1,128 | 33 3 6 | 6 8 1 |
| 3 | 587 | 1,882 | 24 0 1 | 11 14 0 | 17 14 8 | 0 7 6 | 2 0 0 | 14 10 6 | 1,464 | 2,367 | 56 8 10 | 29 13 5 |
| 4 | 280 | 1,450 | 13 7 7 | 11 8 2 | 11 2 4 | 0 8 4 | 2 0 0 | 4 2 0 | 1,066 | 1,435 | 40 2 4 | 13 6 11 |
| 5 | 375 | 1,775 | 17 7 0 | 11 10 8 | 15 1 8 | 1 2 4 | 2 0 0 | 8 1 5 | 1,057 | 1,402 | 39 11 7 | 13 0 2 |
| 6 | 300 | 1,080 | 12 11 3 | 10 15 10 | 11 5 8 | 0 8 4 | 2 0 0 | 3 5 8 | 829 | 906 | 30 3 9 | 3 8 4 |
| 7 | 200 | 960 | 9 5 7 | 10 12 6 | ... | 0 10 10 | 2 0 0 | ... | 722 | 881 | 26 11 5 | ... |
| 8 | 242 | 1,317 | 11 14 1 | 9 0 2 | 8 14 6 | 0 8 4 | 2 0 0 | 2 8 6 | 778 | 1,172 | 29 9 6 | 2 14 1 |

Here also rust caused immense damage. In previous years two irrigations have been given, but this season only one was used, owing to the heavy cold-weather rainfall. The amount of water expended ranged from 7,642 to 13,372 cubic feet per acre in different plots. It will be observed that irrigation added very little to the outturn, but that in the first three plots it more than covered its cost. The averages for the two preceding years compared with those for the A. series (unirrigated) are very striking and clearly show the great benefit which manured wheat obtains from irrigation.

**Serial No. 20.**—VILLE SERIES.—SUBJECT.—*Practical method of soil analysis by using chemical manures, as devised by M. Georges Ville.*

Plot 1.—Area 0·05 acre. Manured with Ammonic chloride at 140 lbs. per acre.
" Calcic superphosphate at 180 lbs. per acre.
" Potassic sulphate at 90 lbs. per acre.
" Calcic sulphate at 100 lbs. per acre.
" 2. " 0·05 " As above, less calcic superphosphate.
" 3. " 0·05 " As in plot 1, less ammonic chloride.
" 4. " 0·05 " No manure.
" 5. " 0·05 " As in plot 1, less potassic sulphate.
" 6. " 0·05 " As in plot 1, less calcic sulphate.
Commenced in 1890-91. Crop in 1892-93 wheat—irrigated once.

| No. of plot. | Actuals, 1892-93. | | | | Average for two previous years. | | | |
|---|---|---|---|---|---|---|---|---|
| | Outturn per acre. | | | Gain in value of produce on plot 4. | Outturn per acre. | | | Gain in value of produce on plot 4. |
| | Grain. | Straw. | Value. | | Grain. | Straw. | Value. | |
| | lbs. | lbs. | Rs. a. p. | Rs. a. p. | lbs. | lbs. | Rs. a. p. | Rs. a. p. |
| 1 | 480 | 2,680 | 23 13 0 | 16 12 2 | 1,832 | 2,567 | 54 13 11 | 24 2 7 |
| 2 | 325 | 2,495 | 18 9 10 | 11 9 0 | 1,385 | 2,532 | 57 1 1 | 26 5 9 |
| 3 | 105 | 975 | 6 10 1 | 0 6 9 | 757 | 1,550 | 31 15 9 | 1 4 |
| 4 | 130 | 890 | 7 0 10 | ..... | 737 | 1,450 | 30 11 4 | ..... |
| 5 | 535 | 2,345 | 24 3 0 | 17 2 2 | 1,447 | 2,640 | 59 4 5 | 28 1 |
| 6 | 415 | 2,365 | 20 12 2 | 13 11 4 | 1,255 | 2,552 | 52 3 2 | 21 7 10 |

This experiment has for its object the practical analysis of soil. The four manures used contain almost all the substances in which soils are found deficient. The wheat was late sown and at one time was most promising. But it was almost wholly ruined by rust, and the outturns are so small that they fail to indicate the real effect of the manures. It will be observed that plot 5 from which potassic sulphate was excluded gave this year, and in previous years, a rather larger outturn than plot 1. But I suspect that this is the result of the lie of the land. So far as past trials go there would not appear to be any reason to suppose that potash either improves or diminishes the outturn.

## (B).—SPECIAL EXPERIMENTS.

4. I now give details of special experiments that were conducted during the year under report. These were made to compare—

(1) the yield of indigenous varieties of cotton with that of acclimatized American varieties,

(2) thick *versus* thin sowing of wheat,

(3) the yield of different varieties of linseed,

(4) to test the effect of sheep-folding for cotton.

**Fields Nos. 9 & 59.—SUBJECT.—*Different varieties of cotton.***

Field No. 9—

Plot 1.—Area 0·27 acre. Cotton Jari
" 1. " 0·27 " " Bani.
" 3. " 0·27 " " Nimari.
" 4. " 0·27 " " Upland Georgian.
" 5. " 0·27 " " Tree.

Field No. 59—

Plot 1.—Area 0·31 acre. Cotton Jari.
" 2. " 0·31 " " Bani.
" 3. " 0·31 " " Nimari.
" 4. " 0·31 " " Upland Georgian.
" 5. " 0·31 " " Tree.

| No. of field. | No. of Plot. | Area. | Treatment in preceding year. | | Treatment in year under report. | | Outturn per acre. | | | Cost of cultivation per acre. | Cost of manure per acre. | Loss in value of produce on the plot sown with *jari*. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Crop. | Manure. | Crop. | Manure and rate per acre. | Lint. | Seed. | Value. | | | |
| | | Acres. | | | | | lbs. | lbs. | Rs. a. p. | Rs. a. p | Rs. a. p. | Rs. a. p. |
| 9 | 1 | ·27 | Linseed. | *Nil.* ... | Cotton, Jari ... | Dung 160 maunds. | 112 | 247 | 32 9 11 | 13 11 [illegible] | 11 6 9 | ... |
| | 2 | ·27 | " ... | " ... | " Bani ... | " ... | 95 | 261 | 31 13 11 | 14 3 [illegible] | 11 6 9 | —0 12 0 |
| | 3 | ·27 | " ... | " ... | " Nimari ... | " ... | 84 | 254 | 28 8 3 | 13 5 7 | 11 6 9 | —0 6 2 |
| | 4 | ·27 | " ... | " ... | " Upland Georgian . | " ... | 90 | 242 | 30 0 11 | 12 2 9 | 11 6 9 | —1 9 0 |
| | 5 | ·27 | " ... | " ... | " Tree ... | " ... | 76 | 193 | 25 3 2 | 10 12 [illegible] | 11 6 9 | —2 15 3 |
| 59 | 1 | ·31 | Juar ... | *Nil.* .. | Cotton, Jari ... | Dung 16 maunds | 108 | 235 | 31 6 5 | 10 14 9 | 11 12 5 | ... |
| | 2 | ·31 | " ... | " ... | " Bani ... | " .. | 92 | 244 | 30 10 9 | 11 9 5 | 11 12 5 | —0 11 8 |
| | 3 | ·31 | " ... | " .. | " Nimari ... | " ... | 73 | 208 | 24 9 2 | 10 9 11 | 11 12 5 | —5 13 3 |
| | 4 | ·31 | " .. | " ... | " Upland Georgian . | " ... | 88 | 209 | 27 7 9 | 9 14 4 | 11 12 5 | —3 14 3 |
| | 5 | ·31 | " ... | " ... | " Tree ... | " .. | 78 | 199 | 25 14 0 | 9 8 5 | 11 12 5 | —4 8 5 |

In both experiments the *jari* variety shows best, its larger outturn compensating for its lower value. The value of the *bani* crop is, however, but very little behind. *Jari* is the short stapled cotton commonly sown in the neighbourhood; whereas *bani*, though also a local variety, is of much finer quality. *Jari* produce is of comparatively low value, being priced at Rs. 88 per *bojha* of 345 lbs., whereas the other varieties are all valued at Rs. 100 by the Manager of the Empress Mills.

**Field No. 23.—SUBJECT.—Thick *versus* thin sowing.**

Plot 1.—Area 0 25 acre. Seed sown 60 lbs. per acre.
" 2. " 0·25 " " 90 lbs. "
" 3. " 0·25 " " 120 lbs. "

| No. of Plot. | Outturn per acre. | | | Cost of cultivation per acre. | Gain (+) or loss (—) compared with plots sown with 90 lbs. only. | | |
|---|---|---|---|---|---|---|---|
| | Grain. | Straw. | Value. | | In value of seed grain. | In value of produce. | Net (+) or (—). |
| | lbs. | lbs. | Rs. a. p. | Rs. a p. | Rs. a. p. | Rs. a. p. | Rs. a. p. |
| 1 | 615 | 709 | 20 8 6 | 9 12 0 | +0 9 3 (=30 lbs.) | —2 2 0 | —1 8 9 |
| 2 | 671 | 845 | 22 10 6 | 10 15 0 | ..... | ..... | ..... |
| 3 | 667 | 1,177 | 23 12 2 | 12 3 8 | —1 2 6 (=20 lbs.) | +1 1 8 | —0 0 10 |

These results confirm those of preceding years, in showing that 90 lbs. per acre is the most profitable rate of sowing. The 120 lbs. rate gave a small increase in produce, but the cost of the additional seed outbalances this profit.

**Fields Nos. 35 & 61.**—SUBJECT.—White *versus* red linseed.

d No. 35—Fiel

Plot 1.—Area 0·24 acre. Linseed, red
„ 2. „ 0·67 „ „ white.

Field No. 61—

Plot 1.—Area 0·33 acre. Linseed, white.
„ 2. „ 0·33 „ „ red.
„ 3. „ 0·33 „ „ white.

| No. of field. | No. of plot. | Area. | Treatment in preceding year. | | Treatment in year under report. | | Outturn per acre. | | | Cost of cultivation per acre. | Cost of manure per acre. | Gain in value of produce. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Crop. | Manure. | Crop. | Manure and rate per acre. | Grain. | Straw. | Value. | | | |
| | | Acres. | | | | | lbs. | lbs. | Rs. a. p | Rs. a. p. | Rs. a. p | Rs. a. p. |
| 35 | 1 | ·24 | Cotton... | *Nil.* ... | Linseed (red).. | Dung, 160 mds. | 116 | 262 | 7 2 5 | 7 5 8 | 11 4 7 | ... |
| | 2 | ·67 | „ ... | „ ... | „ (white) | „ ... | 104 | 260 | 7 0 6 | 6 11 0 | 10 9 0 | —0 1 11 |
| 61 | 1 | ·33 | Cotton... | Dung | Linseed (white) | *Nil.* ... | 161 | 276 | 10 7 9 | 7 2 2 | ... | —5 15 3 |
| | 2 | ·33 | „ ... | „ ... | „ (red)... | „ ... | 258 | 754 | 16 7 0 | 7 8 5 | ... | ... |
| | 3 | ·33 | „ ... | „ ... | „ (white) | „ ... | 207 | 542 | 14 1 2 | 7 8 2 | ... | —2 5 10 |

White linseed is known as *haura* and red as *katha*. The *katha* is the hardier and more prolific of the two, and was not so much affected by the linseed disease known as *talap*. Its value is generally below that of *haura* by about Rs. 2 per khundy; but its larger yield compensates for this. In this respect *katha* linseed resembles the local *jari* cotton. The ryots generally sow a mixture of red and white linseed locally known as "chavalkatha".

**Field No. 13.**—SUBJECT.—*Effect of sheep dung on cotton.*

| No. of field. | No. of plot. | Area. | Treatment in preceding year. | | Treatment in year under report. | | Outturn per acre. | | | Gain in value of produce. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Crop. | Manure. | Crop. | Manure and rate per acre. | Lint. | Seed. | Value. | |
| | | Acres. | | | | | lbs. | lbs. | Rs. a. p | Rs. a. p. |
| 13 | 1 | 0·09 | Linseed ... | Nil. ... | Cotton (Broach). | Sheep dung... | 97 | 230 | 32 0 7 | 20 5 11 |
| | 2 | 0·08 | „ ... | „ ... | „ ... | Nil. ... | 35 | 93 | 11 10 8 | ... |

The experiment was started to test the effect of sheep dung. The sheep, about 40 in number, were folded by bamboo hurdles for 8 days on an area of 80 square yards. The gain in value over plot No. 2 was about Rs. 20. The local practice of sheep folding is that about 100 sheep are folded for a month to the acre of land, the cultivator giving the sheep owner one paili (=2½ lbs.) of *juari* per head of sheep.

5. The table below shows the influence of season on wheat and linseed crops and the average outturn of these crops since 1884-85:

| | 1884-85. | 1885-86. | 1886-87. | 1887-88. | 1888-89. | 1889-90. | 1890-91. | 1891-92. | 1892-93. |
|---|---|---|---|---|---|---|---|---|---|
| | Inches. | Inches. | Inches. | Inches. | Inches. | Inches. | Inches. | Inches. | Inches. |
| September ... | 14·21 | 3·57 | 4·69 | 8·64 | 5·75 | 5·63 | 13·02 | 24·69 | 11·54 |
| October and first half of November ... | 0·71 | 1·61 | 10·69 | 6·62 | 0·61 | 4·00 | 2·59 | 0·59 | 3·74 |
| Second half of November and from December 1st to January 15th ... | 2·68 | 4·17 | 0·63 | 1·88 | 0·78 | ... | 2·62 | ... | 2·13 |
| From January 15th to March 31st ... | 1·97 | 0·66 | ... | 0·50 | 0·01 | 0·26 | 2·66 | 0·57 | 5·36 |
| | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. |
| Compare average outturn of wheat (haura) ... | 422 | 409 | 520 | 389 | 165 | 321 | 672 | 408 | *640 |
| Linseed ... | 215 | 166 | 188 | 161 | 238 | 256 | 290 | 82 | 58 |

It will be seen that the rainfall of 1884 and 1885 and 1890-91 somewhat resembled that of the year under report and that in spite of rust the outturn of wheat was above the average. The linseed crop was ruined by the disease known as *talap*.

6. The total area under cultivation during the year was 66·68 acres, of which 26·22 acres were experimental and 40·46 acres non-experimental. Details are given in Annexure A. Annexure B. gives the average rate per acre of the cost of each process of cultivation as recorded in the case of each field in the Farm Cultivation Book. Annexure C. shows the rates at which the produce has been valued. Annexure D. gives a list of the continuous experiments now in progress on the Farm.

7. *Use of prickly pear as cattle fodder.*—An experiment was made to test the value of chopped prickly pear as cattle fodder on the lines indicated in a report from the Superintendent of Farms, Bombay, No. 199, dated the 1st April 1892. To accustom the cattle to the change in food, the quantity of pear was mixed in the usual diet in an increasing proportion from lbs. 3 to lbs. 20. Two bullocks on the farm were chosen for the experiment, a third fed on the ordinary ration being added a week later. The experiment was started on the 28th February 1893. The usual ration of each bullock was 10½ lbs. grass, 1½ lbs. cotton seed, 1½ lbs. linseed oilcake and a little salt besides grazing.

Bullocks Nos. 1 and 2 were fed on prickly pear. The substitution of the prickly pear for the ordinary ration was effected gradually. On the 1st day only 3 lbs. were given *plus* four-fifths of the ordinary ration. The amount was increased by 3 lbs. a day up to the 3rd day when they received 9 lbs. *plus* two-fifths of the ordinary ration. This rate was continued for 5 days when the amount of prickly pear was raised to 15 lbs. and all further ration stopped. This continued from the 8th March to the 17th March, when the bullocks showing some dislike to the food, I again added some portion of their ordinary food. But from the 13th April they were again restricted entirely to the prickly pear, and they received nothing else up to the 1st June. The quantity of prickly pear consumed rose to 20 lbs. daily after the 11th May. The bullocks at first showed some dislike to the new food, leaving some portion of it, and there can be no doubt that animals require coaxing at the outset. But after a couple of months they were completely accustomed to it, and ate with all appearance of readiness. The diet produced looseness in their excreta, but so far as could be judged from their weights they suffered no harm. I compare below the weights as taken on different dates:—

| Dates. | No. 1. | No. 2. | No. 3. |
|---|---|---|---|
| | lbs. | lbs. | lbs. |
| 16th March 1893 ... | 868 | 688 | 756 |
| 24th March 1893 ... | 859 | 764 | 784 |
| 10th April 1893 ... | 880 | 764 | 788 |
| 28th April 1893 ... | 896 | 800 | 824 |
| 10th May 1893 ... | 871 | 785 | 800 |
| 20th May 1893 ... | 880 | 800 | 805 |
| 1st June 1893 ... | 888 | 820 | 812 |

* Exclusive of the specially manured and irrigated series of plots.

The four last weighments were made at a time when bullocks Nos. 1 and 2 were receiving no stall food save the prickly pear. It will be observed that their weights suffered no loss, and indeed increased. The weight of the third bullock also increased. But it is clear that the prickly pear diet was nourishing. The animals were in full work throughout the time of the experiment. As for the cost of the prickly pear, a man can prepare 30 lbs. in six hours' time, and its cost will then be between two and half and three annas. The ordinary ration costs four annas per pair, so there is a considerable saving. But the chief conclusion to be drawn from the experiment is that in times of scarcity a useful supply of cattle fodder can be obtained from what is ordinarily considered a useless shrub.

8. *Carbon bisulphide.*—The following is the result of an experiment with carbon bisulphide as a preventive against the attacks of weevils on wheat:—

| Serial No. | No of sacks. | Quantity stored in sacks. | Treatment. | Date of storing of grain. | Date of recharging. | Date of opening of sacks. | Percentage of weeviled grain. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | Mds. | | | | | | |
| I. | 2 | 5 | Containing fresh wheat grain uncharged and unprotected by tarpaulins. | 27th May 1892 | Not re-charged. | 9th October 1892. | 3·75 | |
| II. | 2 | 5 | Containing fresh wheat grain once charged with bisulphide (at time of bagging) and protected by a tarpaulin. | Do. ... | Do. ... | Do. ... | 1·25 | |
| III. | 2 | 5 | Containing fresh wheat grain charged with bisulphide [illegible] of bagging and re-charged in August; protected by a tarpaulin. | Do. ... | 12th August 1892. | Do. ... | 3·75 | The large percentage of weeviled grain is owing to the bags being opened in the rains. |
| IV. | 2 | 5 | Containing old wheat grain infested with weevil charged with bisulphide and protected by a tarpaulin. | Do. ... | Not re-charged. | Do. ... | 20 | There were 12 per cent. weeviled grain when experimented upon. |

The bags were charged by the insertion of a piece of tow saturated with the chemical. It is at first sight curious that the grain charged twice with carbon bisulphide should have suffered equally with uncharged grain. The exposure of the grain to the damp air of the monsoon seems to have aggravated the attacks of the weevils. The bags were unfortunately all old bags, and this vitiates the experiment as they may have contained some weevils or weevils' eggs. The results of the fourth experiment show that, carbon bisulphide is of little use when the weevils have once secured their footing.

9. *Trials with Fungicides.*—Trial was made of spraying with sulphate of iron and sulphate of copper as a preventive against rust. The former was applied before the rust made its appearance to parts of two fields which from their low situation seemed likely to suffer. It was used in a solution of 1 to 160 parts, and was sprayed each week. The field was attacked very severely by rust, and the spraying showed no effect whatever.

The sulphate of copper was used in a solution of 1 to 400 parts. It was applied by spraying to fields in which rust had appeared, but gave no beneficial results.

10. *Implements.*—The new appliance of which trial was made during the year was the Lavall's baby cream-separator, mention of which is made in last year's report. This machine was lent free of charge for six months to a Mr. Nazareth, who had started a dairy supply, but he failed in it partly owing to the opposition of the residents' servants, and partly owing to his having to purchase the milk, not having in Nagpur his own milch cattle. Hunt's simple chaff-cutter was tried on the Farm; its work is expeditious and cheap, but is not sufficiently strong. Its knives have bent in a very short time.

11. *Sewage Farm.*—The area leased out to the tenants of the sewage farm during the year was 23·75 acres, out of which 6·75 acres are leased out at a reduced rate as the ryots had

been recently shifted. Seventeen acres are leased out at 20 per acre *plus* water-rate at 8 annas each acre watering. The supply of water to the Jail having been now stopped the sewage cultivation has greatly improved, and this year the sugarcane is in a very thriving condition.

12. *Agricultural Class.*—The working of the Agricultural Class is separately reported upon and nothing beyond very brief note is required here.

The year opened with 11 senior students from the previous year, and only 10 more joined the class. Two of them were scholarship-holders by private subscription.

Practical instruction was insisted upon. The senior students as usual sowed both kharif and rabi crops on their half-acre plots, while the juniors sowed a rabi crop only, practising at ploughing and bakharing throughout the rainy season. They threshed the produce with their own hands, and each student was allowed to keep his own produce. The plots were not of good soil, so that their cultivation was rather discouraging. They have now been shifted to a fresh piece of really good land which has been fenced, and in future the students will have nothing to complain of. The class was as usual examined at the end of the year by examiners who had no connection with the teaching. The results were most encouraging. All of the senior students passed duly qualified, and 9 out of the 10 juniors earned promotion to the second year's course. In the Normal Agricultural Class for village schoolmasters, there were 30 pupils from 16 districts in the first term commencing from June to October, of which 29 passed the final examination. In the second term commencing from November to March there were 29 masters from 17 districts, of which 28 passed qualified.

13. *Financial results.*—These are given below :—

| | Expenditure. | | | Receipts. | Net cost. |
|---|---|---|---|---|---|
| | Salaries. | Contingencies. | Total. | | |
| | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p. | Rs. a. p. |
| Budget ... | 4,824 0 0 | 4,686 0 0 | 9,510 0 0 | 1,800 0 0 | 7,710 0 0 |
| Actual ... | 4,405 15 9 | 4,641 5 11 | 9,047 5 8 | 2,071 12 9 | 6,975 8 11 |

The net cost of the Farm to Government was less by Rs. 735 than in the year preceding.

14. *Staff.*—The Overseer of the farm, Mr. Hari Ramchandra Chakradeo, has given me good assistance, which was the more needed as I was quite new to the work.

I have the honour to be,

Sir,

Your most obedient Servant,

R. S. JOSHI,

*Superintendent, Experimental Farm,*

*Nagpur.*

## LIST OF ANNEXURES.

A.—Statement showing the total area under cultivation on the Experimental Farm, Nagpur, during 1892-93.

B.—Statement showing the average rates of the cost of cultivation on the Experimental Farm, Nagpur, during 1892-93.

C.— Statement showing the rates used for valuing the produce of the Experimental Farm, Nagpur, during 1892-93.

D.—Programme of contd. at time experiments as it stood on the 1st June 1893.

# Annexure A.

*Total area under cultivation on the Experimental Farm, Nagpur, during the year* 1892-93.

| Crop. | Area. | Total. | Grand Total. |
|---|---|---|---|
| | Acres. | Acres. | Acres. |
| **A.—EXPERIMENTAL AREA.** | | | |
| (1). *Kharif*— | | | |
| Cotton alone ... ... ... ... | 5·97 | | |
| Cotton and tur ... ... ... ... | 1·43 | | |
| Cotton and juar ... ... ... ... | 26 | | |
| Juar alone ... ... ... ... | 1·14 | | |
| Tur ... ... ... ... | 1·26 | | |
| Rosello ... ... ... ... | 56 | | |
| | | 10·62 | |
| (2). *Rabi*— | | | |
| Wheat ... ... ... ... | 10·71 | | |
| Wheat and gram mixed ... ... ... ... | ·21 | | |
| Gram ... ... ... ... | ·46 | | |
| Linseed ... ... ... ... | 3·98 | | |
| Lafflower ... ... ... ... | ·24 | | |
| | | 15·60 | |
| | | | 26·22 |
| **B.—NON-EXPERIMENTAL AREA.** | | | |
| (1). *Kharif*— | | | |
| Cotton ... ... ... ... | ·17 | | |
| Juar alone ... ... ... ... | 7·97 | | |
| Juar and tur ... ... ... ... | ·96 | | |
| Bajra and mung ... ... ... ... | 1·34 | | |
| Guinea grass ... ... ... ... | ·18 | | |
| Tur ... ... ... ... | 9·75 | | |
| Popat ... ... ... ... | 4·46 | | |
| Til ... ... ... ... | ·72 | | |
| Castor ... ... ... ... | 1·37 | | |
| San hemp ... ... ... ... | ·65 | | |
| | | 27·57 | |
| (2). *Rabi*— | | | |
| Wheat ... ... ... ... | 3·00 | | |
| Linseed ... ... ... ... | 3·07 | | |
| Gram ... ... ... ... | 4·16 | | |
| Masur ... ... ... ... | ·45 | | |
| Oats ... ... ... ... | 1·31 | 12·89 | 40·46 |
| | | | 66·68 |

# Annexure B.

*Statement showing the average cost per acre of each operation of cultivation on the Experimental Farm, Nagpur, during the year* 1892-93, *as deduced from the Field Cultivation Book.*

[NOTE.—The hire of a pair of bullocks is taken as 12 annas, of a male cooly 3 annas, of a female cooly 1½ annas, and of a child 1 anna.]

| Class of operation. | Detail. | Rate per acre. Rs. | a. | p. | Explanation. |
|---|---|---|---|---|---|
| Cost of tillage. | Ploughing by Swedish plough ... ... .. | 1 | 7 | 11 | A pair of bullocks and a man for 1·59 days. |
| | Hoeing by bakhar (bullock hoe) ... ... .. | 0 | 8 | 4 | Do. for ·55 day. |
| | Weed hoeing by daura (small bullock weeding hoe) ... ... ... ... ... .. | 0 | 5 | 1 | Do. and 2 men for ·28 day. |
| | Do. by dundia (large do. do.) .. | 0 | 5 | 6 | Do. do. for ·30 day. |
| | Weeding by hand ... ... ... .. | 0 | 15 | 0 | 10 women for a day. |
| Cost of sowing, including cost of seed. | Cotton by argarha (country drill hoe) ... .. | 0 | 7 | 0 | 13 lbs. of seed (Re. 0-3-9). A pair of bullocks and a man and 3 women for ·16 day. |
| | Tur do. do. ... ... ... .. | 0 | 8 | 3 | 12 lbs. of seed (Re. 0-4-4) do. do. for ·20 day. |
| | Juar by tifan (country drill) ... ... .. | 0 | 8 | 9 | 9 lbs. of seed (Re. 0-3-10). A pair of bullocks and 2 men for ·27 day. |
| | Gram by nari nagar (drill plough) ... . | 1 | 15 | 1 | 23 lbs. of seed (Re. 0-14-5) do. do. for ·91 day. |
| | Covering gram by argarha ... ... .. | 0 | 6 | 6 | A pair of bullocks and a man for ·43 day. |
| | Linseed by tifan (country drill) ... .. | 1 | 6 | 2 | 12 lbs. of seed (Re. 0-11-4). Two pairs of bullocks and 3 men for ·32 day. |
| | Wheat by nari nagar (plough drill) ... .. | 3 | 15 | 9 | 80 lbs. of seed (Rs. 3-1-3) do. do. for ·43 day. |
| manure (excluding loading, carting and spreading | ... ... ... .. | 13 | 15 | 3 | 240 lbs. @ Rs. 4-10-5 per maund. |
| | Bone-dust ... ... ... ... ... .. | 3 | 6 | 0 | 360 lbs., cost of collecting Re. 0-3-0 per maund and of crushing Re. 0-4-0 per maund. |
| | Cattle dung ... ... ... ... .. | 10 | 0 | 0 | 160 maunds @ Re. 0-1-0 per maund. |
| | Ashes of dung ... ... ... ... .. | 11 | 0 | 8 | 160 maunds dung @ Re. 0-1-0 per maund, and drying and burning Rs. 1-0-8 per maund. |
| | Green-soiling with *san* hemp ... ... ... | 9 | 3 | 6 | 100 lbs. of seed Rs. 2-3-10, sowing Re. 0-0-10, covering seed by harrow Re. 0-3-4, and cutting and ploughing Rs. 6-11-6. |
| | Do. with tarota (Cassia auriculata) ... ... | 17 | 13 | 0 | Cutting and carting tarota Rs. 11-13-3 and ploughing Rs. 2-15-9. |
| Cost of harvesting. | Picking cotton ... ... ... ... ... | 0 | 3 | 11 | 2 women for 1·30 day—each picking. |
| | Reaping juar ... ... ... ... . .. | 0 | 9 | 7 | 8 do. for ·79 day. |
| | Do. gram ... ... ... ... ... | 0 | 9 | 9 | 7 do. for ·92 day. |
| | Do. linseed ... ... ... ... ... | 0 | 2 | 9 | 5 do. for ·36 day. |
| | Do. wheat ... ... ... ... ... | 0 | 11 | 6 | 4 do. for 1·91 day. |
| Cost of threshing and cleaning. | Ginning cotton (by country hand-charkha) ... | 2 | 2 | 2 | 15 women for 1·51 day—average produce per acre 235 lbs. of seed cotton. |
| | Threshing and cleaning juar ... ... ... | 0 | 4 | 11 | 1 man and 1 woman for a day—average produce per acre 318 lbs. grain and 1,938 lbs. of karbi. |
| | Do. gram ... ... ... ... ... | 1 | 4 | 9 | 4 bullocks and 1 man for ·76 day—average produce per acre 431 lbs. grain and 626 lbs. straw. |
| | Do. linseed ... ... ... ... .. | 0 | 3 | 7 | 2 women for 1·19 day—average produce per acre 78 lbs. grain and 196 lbs. stalks. |
| | Do. wheat ... ... ... ... ... | 0 | 12 | 9 | 2 bullocks, 2 men and 2 women for ·60 day—average produce per acre 578 lbs. grain and 1,383 lbs. straw. |

# Annexure C.

*Statement showing the rates used for valuing the produce of the Experimental Farm, Nagpur, during the year* 1892-93.

| Name of produce. | Value. Rate. | Value. Per. | Remarks. |
|---|---|---|---|
| | Rs. a. p. | | |
| Cotton ... Lint ... (according to quality) ... | 100 0 0<br>88 0 0 | Bojha of 345 lbs. | |
| Cotton seed ... ... ... ... ... | 10 8 0 | Khandi of 640 lbs. | |
| Juar ... Grain ... ... ... ... | 10 0 0 | Do. of 390 lbs. | |
| Juar ... Karbi ... ... ... ... | 20 0 0 | Sheaves 1,000. | About 3,460 lbs. |
| Tur ... Grain ... ... ... ... | 8 0 0 | Khandi of [illegible] s. | |
| Tur ... Stalks ... ... ... ... | 0 12 0 | 8 bundles. | About 560 lbs. |
| Tur ... Bhusa ... ... ... ... | 1 8 0 | One cart-load. | About 478 lbs. |
| Gram ... Grain ... ... ... ... | 14 0 0 | Khandi of 390 lbs. | |
| Gram ... Chaff ... ... ... ... | 1 8 0 | One cart-load. | About 478 lbs. |
| Linseed (haura)... Grain ... ... ... ... | 23 0 0 | Khandi of 385 lbs. | |
| Linseed (haura)... Stalks and bhusa ... ... ... | 1 8 0 | One cart-load. | About 478 lbs. |
| Linseed (katha)... Grain ... ... ... ... | 21 0 0 | Khandi of 385 lbs. | |
| Linseed (katha)... Stalks and bhusa ... ... ... | 1 8 0 | One cart-load. | About 478 lbs. |
| Wheat (haura) unshrivelled ... Grain ... ... | 13 4 0 | Khandi of 400 lbs. | |
| Wheat (haura) unshrivelled ... Straw ... ... | 1 12 0 | One cart-load. | About 478 lbs. |
| Do. do. shrivelled ... Grain ... ... | 10 8 0 | Khandi of 360 lbs. | |
| Do. do. shrivelled ... Straw ... ... | 1 12 0 | One cart-load. | About 478 lbs. |
| Do. (pissi) ... Grain ... ... | 12 0 0 | Khandi of 400 lbs. | |
| Do. (pissi) ... Straw ... ... | 1 12 0 | One cart-load. | About 478 lbs. |

# Annexure D.

## EXPERIMENTAL FARM, NAGPUR.

*Programme of Continuous Experiments as it stood on the 1st June 1893.*

| Serial No. of experiment. | No. of field. | Purpose of experiment. | Crop. | | | Special treatment. | | | Year (commencing June) in which experiment started. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1st year. | 2nd year. | 3rd year. | 1st year. | 2nd year. | 3rd year. | | |
| 1 | 21—1 | Effect of tillage to various depths. | Wheat ... | Wheat ... | Wheat ... | To be ploughed every year. | | | 1890. | Cropping and treatment similar every year. |
| | —2 | | do. ... | do. ... | do. ... | To be hoed (bakhar ed) every year. | | | | |
| | —3 | | do. ... | do. ... | do. ... | To be ploughed every third year, being hoed during the other two. | | | | |
| 2 | 41 | Effect of embanking rabi fields when manure is used. | do. ... | do. ... | do. ... | Dung ... | Dung ... | Dung. .. | 1885. | There is no unembanked duplicate for comparison, but there are numerous other fields with which a comparison can fairly be made. |
| 3 | 43 | Effect of embanking rabi fields without using manure. | do. ... | do. ... | do. ... | *Nil.* ... | *Nil.* ... | *Nil.* ... | 1885. | To compare with No. 2. |
| 4 | 23—1 | Effect of mixing crops—the principal one being cotton. | Jari cotton ... | Jari cotton ... | Jari cotton ... | do. ... | do. ... | do ... | 1893. | Cropping similar every year, manure to be applied occasionally. |
| | —2 | | Jari cotton and tur in the proportion of 6 lines to 2. | Jari cotton and tur in the proportion of 6 lines to 2. | Jari cotton and tur in the proportion of 6 lines to 2. | do. ... | do. ... | do. ... | | |
| | —3 | | Jari cotton and juar in the proportion of 6 lines to 2. | Jari cotton and juar in the proportion of 6 lines to 2. | Jari cotton and juar in the proportion of 6 lines to 2. | do. ... | do. ... | do. ... | | |
| 5 | 25—1 | Effect of mixing crops—wheat and a leguminous crop (gram). | Wheat ... | Wheat .. | Wheat ... | do. ... | do. ... | do. ... | 1890. | Ditto. |
| | —2 | | Wheat-gram ... | Wheat-gram ... | Wheat-gram ... | do. ... | do. ... | do. ... | | |
| 6 | 61—1 | Effect of rotations with cotton ... | Cotton-tur ... | Cotton-tur ... | Cotton-tur ... | do. .. | do. ... | do. ... | 1893. | Two year rotation, *i. e.*, the fourth year will follow the second. |
| | —2 | | do. ... | Wheat ... | do. ... | do. ... | do. ... | do. ... | | |
| | —3 | | do. ... | Gram ... | do. ... | do. ... | do. ... | do. ... | | |
| 7 | 29—1 | Effect of rotations with wheat ... | Wheat ... | Wheat ... | Wheat ... | do. ... | do. ... | do. ... | 1890. | Ditto. |
| | —2 | | do. ... | Fallow ... | do. ... | do. ... | do. ... | do. ... | | |
| | —3 | | do. .. | Gram ... | do. ... | do. ... | do. ... | do. ... | | |
| | —4 | | do. ... | Juar-tur ... | do. ... | do. ... | do. ... | do. ... | | |
| | —5 | | do. ... | Kodon ... | do. ... | do. ... | do. ... | do. ... | 1891. | |

*Programme of Continuous Experiments as it stood on the 1st June 1893.*—(Concld.)

| Serial No. of experiment. | No. of field. | Purpose of experiment. | Crop. 1st year. | Crop. 2nd year. | Crop. 3rd year. | Special treatment. 1st year. | Special treatment. 2nd year. | Special treatment. 3rd year. | Year (commencing June) in which experiment started. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 57—1 | Effect of rotations with linseed ... | Linseed ... | Linseed ... | Linseed ... | *Nil.* ... | *Nil.* ... | *Nil.* ... | 1890. | Two year rotation, *i. e.*, the fourth year will follow the second. |
| | —2 | | do. ... | Gram ... | do. ... | do. ... | do. ... | do. ... | | |
| | —3 | | do. ... | Cotton ... | do. ... | do. ... | do. ... | do. ... | | |
| | —4 | | do. ... | Tur ... | do. ... | do. ... | do. ... | do. ... | | |
| 9 | 14—1 | Effect of green-soiling with *san* hemp. —on wheat with fallow interposed | Fallow ... | Wheat ... | Fallow ... | Green-soiling with *san* hemp. | do. ... | Green-soiling with *san* hemp. | 1891. | Cropping and treatment similar every other year. |
| | —2 | | do. ... | do. ... | do. ... | *Nil.* ... | do. ... | *Nil.* | | |
| | —3 | —on wheat in rotation with cotton. | Wheat .. | Cotton ... | Wheat ... | Green-soiling with *san* hemp. | do. ... | Green-soiling with *san* hemp. | | |
| | —4 | | do. ... | do. ... | do. ... | *Nil.* ... | do. ... | *Nil.* | | |
| 10 | 17—1 | Effect on wheat and cotton in rotation of green-soiling with papilionaceous weeds. | Wheat ... | Cotton ... | Wheat ... | *Green-soiling with weeds cut from waste land. | do. ... | * Green-soiling with weeds cut from waste land. | 1890. | Do. do. |
| | —2 | | do. ... | do. ... | do. ... | *Nil.* .. | do. .. | *Nil.* ... | | |
| 11 | 32—1 | Effect on wheat of green-soiling with papilionaceous weeds on wheat. | Wheat .. | Wheat ... | Wheat ... | *Green-soiling with weeds cut from waste land. | * Green-soiling with weeds cut from waste land. | * Green-soiling with weeds cut from waste land. | 1891. | Do. every year. NOTE.—It is possible that this field may be irrigated. |
| | —2 | | do. ... | do. ... | do. ... | *Nil.* ... | *Nil.* ... | *Nil.* .. | | |
| 12 | 18—1 | Relative effect of green-soiling box-dung and stall-dung. | Wheat ... | Wheat ... | Wheat ... | *San* hemp ... | *San* hemp ... | *San* hemp ... | 1890. | Cropping and treatment similar every year. |
| | —2 | | do. ... | do. ... | do. ... | *Nil.* .. | *Nil.* ... | *Nil.* ... | | |
| | —3 | | do. ... | do. ... | do. ... | Box-dung | Box-dung .. | Box-dung .. | | |
| | —4 | | do. ... | do. ... | do. ... | Stall-dung .. | Stall dung .. | Stall-dung ... | | |
| 13 | 44—1 | Relative effect on cotton and wheat in rotation of box-dung, stall-dung and bone-dust. | Cotton ... | Wheat ... | As for first year. | Stall-dung ... | Stall dung ... | Stall-dung ... | 1890. | Manures continued every year; crops to be in rotation. |
| | —2 | | do. ... | do. ... | | Box-dung ... | Box-dung ... | Box-dung ... | | |
| | —3 | | do. ... | do. ... | | *Nil.* ... | *Nil.* ... | *Nil.* .. | | |
| | —4 | | do. ... | do. ... | | Bone-dust ... | Bone-dust ... | Bone-dust ... | | |
| 14 | 63—1 | Relative effect on linseed and cotton in rotation of box-dung and stall-dung applied in alternate years only. | Linseed ... | Cotton .. | | Box-dung ... | *Nil.* ... | Box-dung ... | 1890. | To be manured with the same kinds of manures every alternate year and crops to be in rotation. |
| | —2 | | do. ... | do. ... | | *Nil.* ... | do. .. | *Nil.* ... | | |
| | —3 | | do. ... | do. ... | | Stall-dung ... | do. ... | Stall-dung .. | | |
| 15 | 42—1 | Relative effect of dung and bone-dust applied each year on juar and linseed grown in rotation. | Juar ... | Linseed ... | | Dung .. | Dung ... | Dung ... | 1890. | Manures continued every year; crops to be in rotation. |
| | —2 | | do. ... | do. ... | | *Nil.* ... | *Nil.* .. | *Nil.* ... | | |
| | —3 | | do. ... | do. ... | | Bone dust ... | Bone-dust ... | Bone-dust ... | | |
| 16 | 65—1 | Effect of liming soils ... | Wheat ... | Cotton ... | | Caustic lime ... | *Nil.* ... | *Nil.* ... | 1890. | No. 1 was limed in 1890-91, and another application of lime to be made after 12 years. The crops to be in rotation and manures, especially organic ones, to be applied to both the plots equally occasionally. |
| | —2 | | do. ... | do. ... | | *Nil.* ... | do. ... | do. ... | | |

* NOTE.—In 1890, 1891 and 1892, the weed used was *tarota* (Cassia auriculata) which is a Cæsalpinia, not a Papilionaceous plant.

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 68—1 | Effect on wheat of manuring and top-dressing with saltpetre. | Wheat ... | Wheat ... | Wheat ... | *Nil.* ... | *Nil.* ... | *Nil.* ... | 1890. | To be irrigated. Cropping and treatment similar every year. |
| | —2 | | do. ... | do. ... | do. ... | Saltpetre drilled in with seed, 240 lbs. per acre. | Saltpetre drilled in with seed, 240 lbs. per acre. | Saltpetre drilled in with seed, 240 lbs. per acre. | | |
| | —3 | | do. ... | do. ... | do. ... | Saltpetre top-dressing, 80 lbs. per acre. | Saltpetre top-dressing, 80 lbs. per acre. | Saltpetre top-dressing, 80 lbs. per acre. | | |
| 18 | A—1 | Effect on wheat grown continuously of different kinds of manures applied year after year without irrigation. | Wheat ... | Wheat ... | Wheat ... | Saltpetre ... | Same as in first year. | Same as in first year | 1883. | Cropping and treatment similar every year. *Quantities per acre.* Saltpetre ... 240 lbs. Bone-dust ... 360 „ Cattle-dung... 160 mds. Ashes of 160 mds. dung. |
| | —2 | | do. ... | do. ... | do. ... | Bone-dust ... | | | | |
| | —3 | | do. ... | do. ... | do. ... | Saltpetre and bone-dust ... | | | | |
| | —4 | | do. ... | do. ... | do. ... | Cattle-dung ... | | | | |
| | —5 | | do. ... | do. ... | do. ... | Dung and bone-dust. | | | | |
| | —6 | | do. ... | do. ... | do. ... | Ashes of dung ... | | | | |
| | —7 | | do. ... | do. ... | do. ... | *Nil.* ... | | | | |
| | —8 | | do. ... | do. ... | do. ... | *Sans* hemp ploughed in green. | | | | |
| 19 | B—1 | Effect on wheat grown continuously of different kinds of manures applied year after year with irrigation. | Wheat ... | Wheat ... | Wheat ... | Saltpetre ... | Same as in first year. | Same as in first year. | 1890. | To be irrigated. Cropping and treatment similar every year. *Quantities per acre,* as for Series A. |
| | —2 | | do. ... | do. ... | do. ... | Bone-dust ... | | | | |
| | —3 | | do. ... | do. ... | do. ... | Saltpetre and bone-dust. | | | | |
| | —4 | | do. ... | do. ... | do. ... | Cattle-dung ... | | | | |
| | —5 | | do. ... | do. ... | do. ... | Dung and bone-dust. | | | | |
| | —6 | | do. ... | do. ... | do. ... | Ashes of dung ... | | | | |
| | —7 | | do. ... | do. ... | do. ... | *Nil.* ... | | | | |
| | —8 | | do. ... | do. ... | do. ... | *Sans* hemp ploughed in green. | | | | |
| 20 | Ville-1 | Practical method of soil analysis by using chemical manures, as devised by M. Georges Ville. | Wheat ... | Wheat ... | Wheat ... | Amm. Chlor. Cal. Superphosp. : Pot. Sulph. : Cal. Sulph. | Same as in first year. | Same as in first year. | 1890. | Cropping and treatment similar every year and the crop to be irrigated. *Quantities per acre.* Ammonic Chloride, 140 lbs. Calcic Superphosphate, 180 „ Potassic Sulphate, 90 „ Calcic sulphate, 100 „ |
| | —2 | | do. ... | do. ... | do. ... | As in I less Cal. Superphosphate. | | | | |
| | —3 | | do. ... | do. ... | do. ... | As in I less Amm. Chlor. : | | | | |
| | —4 | | do. ... | do. ... | do. ... | No manure ... | | | | |
| | —5 | | do. ... | do. ... | do. ... | As in I less Potassic Sulphate. | | | | |
| | —6 | | do. ... | do. ... | do. ... | As in I less Calcic Sulphate. | | | | |